Chapter 2: Background

Economic Importance

White-tailed deer hunting is economically important in Idaho. Deer hunting, including both white-tailed and mule deer hunting, provided 840,000 hunter days and generated $109 million in retail sales in 2001 (IAFWA 2002). Approximately 2,000 jobs were tied directly to deer hunting in 2001 and resulted in $1.3 million in State Income Tax. Approximately 42% of the state's deer hunter use days were expended in units where the majority of deer harvest was white-tailed deer (IDFG unpubl. data).

Previous Planning

Management of big game animals in Idaho has been guided by various management plans, the first being the Cassia Deer Herd Management Plan developed in the early 1930s. Various other local management plans were developed until the 1980s when the Department adopted the current model for statewide species management plans.

The 1981-1985 white-tailed deer management plan listed 3 primary goals for the management of white-tailed deer in Idaho: 1) increase Idaho's white-tailed deer population, 2) increase harvest, and 3) provide more recreational opportunity. To achieve these goals the plan identified numerous issues including poaching, federal land use practices, competition with livestock or other ungulates, restricted hunting access to private land, depredations, motorized access routes, and development. Additionally, the 1981-1985 plan identified numerous information needs including better harvest information and additional research to better understand whitetail population dynamics. This plan recommended establishing separate seasons for white-tailed deer and establishing white-tailed deer only tags to focus harvest.

The next planning period, 1986-1990, also identified 3 goals: 1) maintain white-tailed deer populations at existing levels in northern Idaho, 2) increase harvest and hunting opportunity in major white-tailed deer units, and 3) increase populations in southern Idaho through trapping and translocating. Population status was estimated and objectives established for each area of the state. In addition to the issues identified in the 1981-1985 plan, the 1986-1990 plan identified road-kills and domestic dogs as important factors. This plan recommended that fire be used to manage habitats and that the eastern portion of the Clearwater Region to be managed for elk as a priority and that southern Idaho deer management be directed toward mule deer.

The 1991-1995 planning process was the first plan to use a random statewide hunter survey to identify preferences to establish management direction. The 1987-1988 Idaho Rifle Deer Hunting Survey (Sanyal et al. 1989) identified 9 general types of deer hunters based on 4 broad categories: nature, hunting skills, harvest, and social reasons. White-tailed deer management units were grouped according to white-tailed deer population and physiographic similarities. The intent of these groupings was to offer hunting opportunities consistent with hunter desires identified in the deer hunter survey. Eight statewide goals were established: 1) maintain populations at current levels in north and north-central Idaho; 2) maintain harvest and increase hunting opportunity in major white-tailed deer units; 3) manage all units north of the

Salmon River (except Unit 14) with hunting season frameworks designed for white-tailed deer; 4) manage all units south of the Salmon River (except Unit 14) with hunting season frameworks designed for mule deer; 5) maintain at least 40% of the buck harvest in the 4+ point category; 6) continue to offer November antlered-only seasons in the Clearwater Region; 7) initiate research in the Clearwater Region to determine seasonal habitat use, survival, and cause-specific mortality; and 8) continue research in the Panhandle Region evaluating cause-specific mortality and winter habitat use. The 1991-1995 plan also evaluated the need for species-specific deer tags to refine management for both species. A significant focus of this plan was to simplify and standardize hunting season frameworks statewide.

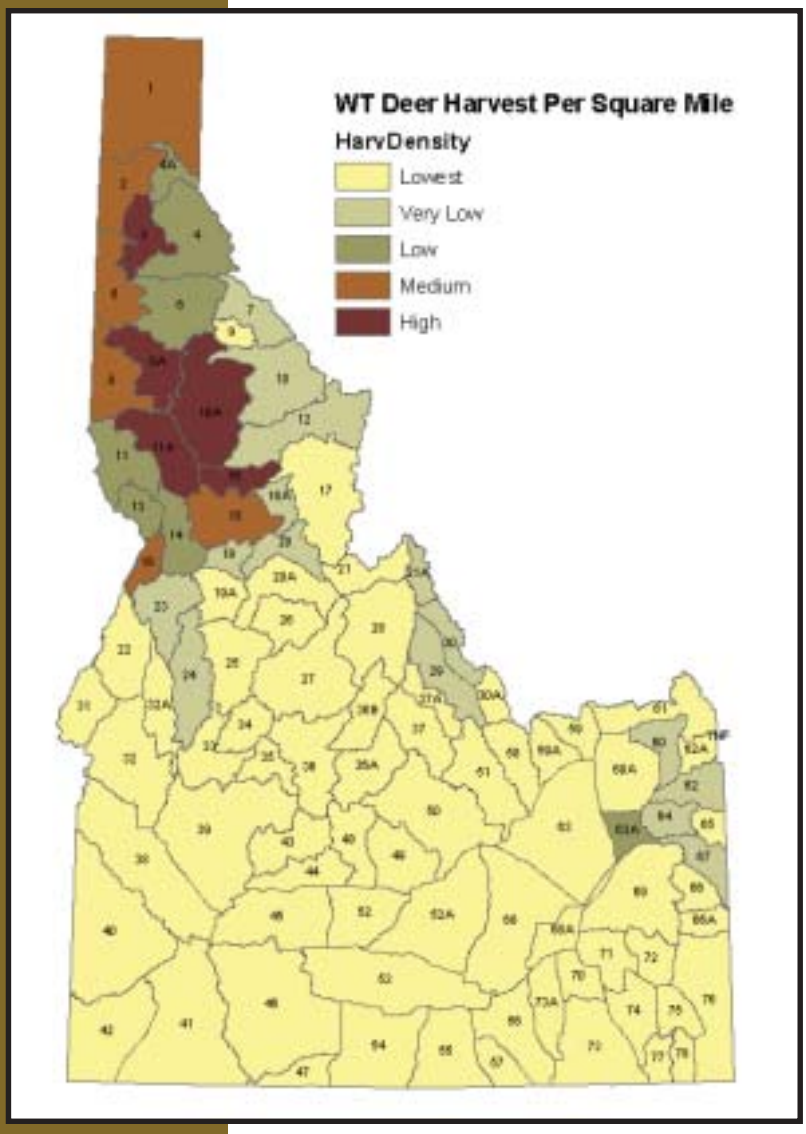

Figure 1. Number of white-tailed deer killed per square mile, 2001 – 2003.

The 1998 plan revision was primarily an effort to document the current status of white-tailed deer in Idaho and establish harvest objectives. GMUs north of the Salmon River were grouped into 7 "DAUs" for data management purposes based on population and physiographic similarities. Objectives were established for %4+ and %5+ point antlers in the harvest. Like previous plans, the 1998 revision also included both white-tailed deer management and mule deer management under a combined management system.

Distribution

White-tailed deer are found from northern South America, northward through Central America, to southern Canada. In the contiguous United States, they are present in all states, although rare in Utah, Nevada, and California. They are generally more abundant in the eastern half of the continent than the west.

The subspecies of white-tailed deer found in Idaho is *Odocoileus virginianus ochrourus*, the northwest white-tailed deer. Within the state, they are abundant north of the Salmon River. The number of white-tailed deer killed per square mile provides a rough map of relative abundance of white-tailed deer in Idaho (Figure 1). The highest densities in the state probably occur in the lower Clearwater and Salmon River drainages. In the southern part of the state, they can be found along major riparian areas, including the Boise, Weiser, Payette, Snake, and Lemhi River drainages.

Historically white-tailed deer may have been more abundant in southern Idaho than they are now. Records from trappers during the mid 1800s suggest whitetails were abundant along most of the river systems in southern Idaho. By the early 1900s, white-tailed deer distribution apparently had been reduced to portions of eastern and northern Idaho (Seton 1909).

Translocations of white-tailed deer to southern Idaho occurred periodically: 1940s in the Payette River drainage, 1950s in the Payette River and Henry's Fork and South

Fork of the Snake River drainages, and 1980s in the Boise, Payette, and Snake River drainages.

Habitat

Winter Ecology and Habitat Use

Winter habitat use of white-tailed deer in Idaho has been described in several studies (Pengelly 1961, Owens 1981, Pauley 1990, Secord 1994). White-tailed deer are very adaptable and some differences in habitat use patterns occurred among these studies. However, synthesis of information from these studies reveals general habitat use patterns that can be used to confirm and extend existing white-tailed deer habitat management guidelines (Jageman 1984). Weather has a strong influence on winter habitat use patterns of white-tailed deer. Mild open winters reduce environmental stress on deer and habitat use may be more variable under these conditions. In the most severe winters availability of key winter range habitat elements becomes critical to white-tailed deer survival.

Habitat selection can generally be related to maintenance of the animal's energy budget (Armleder et al. 1986). All deer at northern latitudes experience winter conditions in which energy losses from movement, cold temperatures, and wind chill exceed energy gains from food intake. When winter range quality is high or winter conditions are mild energy losses only moderately exceed gains and most deer survive the winter. However, when winter ranges are in poor condition or winter conditions are severe, energy losses greatly exceed energy gains and can lead to starvation, increased vulnerability to predation, and substantial winter loss from the deer population. Deer use both topographic and vegetative habitat features to minimize energy losses and maximize energy gains during winter by selecting areas with shallow snow, adequate food, and sufficient shelter.

White-tailed deer movement from summer to winter habitat may involve actual migration from geographically distinct seasonal home ranges or shifts in use patterns within overlapping seasonal home ranges (Pauley 1990, Secord 1994). Snow is the most influential environmental factor during winter and has a significant effect on the energy cost of locomotion. Energy cost of locomotion increases exponentially with increasing snow depth (Mattfeld 1974, Parker et al. 1984). Compared to snow-free conditions, snow accumulations of as little as 5 cm (2 inches) can increase energy expenditures by 10%. When snow accumulation reaches 50 cm (20 inches) energy cost of locomotion may increase to 5 times that of snow-free condition expenditures.

In winter deer move to lower elevations, usually less than 3,000 feet. Low elevation areas generally experience less snow accumulation and milder temperatures than high elevation areas and thus help deer minimize thermoregulation and movement energy costs. Deer select southeast to southwest or west aspects in winter. These aspects receive greater solar exposure than other aspects. This allows deer to minimize energy loss from heat loss. Increased sunshine and associated warmer temperatures also leads to shallower snow depths, consequently reducing energy expenditures for both locomotion and thermoregulation. Further, snow depths are less on slopes than they are on level areas because the same amount of snow is distributed over a larger area on slopes relative to flat areas. When slopes become too steep, energy gains from reduced snow depths are offset by the increase in energy expenditures to climb slopes; deer generally select slopes <50% (Parker et al. 1984, Pauley 1990).

Vegetative characteristics of habitat provide deer 2 broad categories of resources: forage and shelter. Site conditions

on southerly aspects with moderate slopes as described above often result in forest stands that are more open than other sites. This allows greater sunlight to reach the forest floor and greater development of forage species in the shrub layer. In winter whitetails subsist almost entirely on browse. White-tailed deer will consume a wide variety of deciduous browse species but some of the more important species include red osier dogwood (*Cornus stolonifera*), redstem ceanothus (*Ceanothus sanguineus*), serviceberry (*Amelanchier alnifolia*), maple (*Acer glabrum*), pachistima (*Pachistima myrsinites*), willow (*Salix spp.*), and chokecherry (*Prunus virginiana*) (Pengelly 1961). As winter progresses deer also make increasing use of coniferous browse, principally Douglas-fir (*Pseudotsuga menziesii*) and western redcedar (*Thuja plicata*) (Jageman 1984). Pauley (1990) found white-tailed deer making extensive use of these areas in both early and late winter.

Conversely, these open stands have lower snow interception properties than dense stands on more level or more northerly aspects. During mid-winter when snow cover is deepest deer often move to dense mature coniferous forest stands with canopy closure >70% even though the shrub layer is depauperate and forage availability is low on these sites (Peek 1984, Pauley 1990, Secord 1994). White-tailed deer winter habitat selection that optimizes security and thermal cover at the expense of forage availability is well documented (Ozaga 1968, Wetzel et al. 1975, Moen 1976, Boer 1978, Owens 1981). Microclimate studies of closed canopy coniferous stands have demonstrated that these stands have the narrowest thermal ranges, least wind flow, less radiant and convective heat loss, and most favorable snow conditions (Verme 1965; Ozaga 1968; Moen 1968, 1976). Availability of such closed forest stands within white-tailed deer winter ranges is an important winter habitat feature. Ideal winter range will be characterized by a high degree of horizontal diversity with both shrub and open forest habitats with high forage densities in close proximity to dense, closed forest stands with superior shelter qualities. This habitat structure allows deer to minimize energy expenditures when moving between these areas to meet habitat resource needs in the face of changing winter snow and weather conditions.

Summer Ecology and Habitat Use

In contrast to winter habitat use, summer habitat use by white-tailed deer has not been as well studied (Pauley 1990). White-tailed deer are highly adaptable and, in the absence of the stress of deep snow and cold temperature, they can successfully exploit a wide variety of habitat conditions including forest, shrub, agricultural, riparian, and suburban settings. Because of this adaptability, characterizing habitat use during summer is more difficult.

However, habitat selection can again be related to the annual energy budget of white-tailed deer and some generalizations are possible. Whereas deer energy losses exceed energy gains through winter, summer energy gains must exceed energy losses so that deer can recover lost condition and replenish energy reserves for the upcoming winter. Although we typically think of winter range quality as the critical population "bottleneck" because this is when we observe mortality, some have suggested adequate accumulation of energy reserves during summer is at least as critical to winter survival because condition of deer entering winter strongly influences their ability to survive (Ozoga and Verme 1970). Summer range quality has also been linked to productivity, recruitment, and growth rate in deer (Cheatum and Morton 1946, Cheatum and Severinghaus 1950, Julander et al. 1961, and Verme 1963). Winter habitat selection emphasizes minimizing energy losses whereas summer habitat selection emphasizes maximizing energy gains.

At winter's end deer energy reserves are at their annual low point and fetal devel-

opment in the final trimester is placing high nutritional demands on does (Verme 1969, Moen 1973). Consequently, deer select spring/summer/fall habitats with the most nutritious forages available. Open canopy, low elevation, southerly exposed habitats are the first to be snow free and support new nutritious green forage in the spring and whitetails demonstrate a decided shift from forested to open habitats in the spring (Garrott et al. 1987, Pauley 1990, Secord 1994). White-tailed deer use of grass, forbs, and agricultural crop forages is higher in spring and early summer than at any other time of year (Peek 1984). Low-elevation burned areas, riparian habitats, clear cuts, warm well-drained slopes with minimal canopy closure, and agricultural areas can all fulfill this habitat requirement. Deer often select forest ecotones adjacent to foraging areas and may limit their use to edges of these openings while avoiding interiors of large openings (Gladfelter 1966, Telfer 1974, Keay and Peek 1980). Several studies have suggested forest cutting units and prescribed burns should be restricted to not more than 20 acres in size to provide maximum benefits to white-tailed deer (Peek 1984).

As summer progresses deer initially follow spring green-up to higher elevations, make extensive use of clearcuts, burns, and open forest areas, but eventually shift to more mesic northerly aspects and forested habitats in late summer and fall. Whitetail use of older timber stands and mesic sites, and diminished use of clearcuts and open areas in late summer and fall is related to plant phenology. Dry, hot weather during July and August dries deciduous species in open areas. Freezing temperatures in October and November further diminish forage in open habitats whereas dense forest canopies maintain moist conditions and moderate temperatures resulting in greater availability nutritious forage in these habitats (Pauley 1990). This late summer/fall shift to northerly aspects and mesic sites has been described in several studies (Shaw 1962, Owens 1981, Pauley 1990). The shift to denser forest stands may also be related to hot weather. Canopy cover reflects solar radiation and provides cooler, more comfortable temperatures than open areas in summer (Moen 1968, 1976). However, white-tailed deer are also frequently observed bedding in open areas during summer (Pauley 1990).

Security Habitat

Habitat used by deer to avoid detection and minimize disturbance by man, his machines, or by other animals is called hiding or security cover. Security cover cuts energy expenditures by reducing both the need to flee and distance to flee. This cover component may also prevent direct mortality from predation or hunting by allowing deer to avoid detection. Security cover is typically provided by screening vegetation, screening topography, and distance from potential sources of disturbance. Hiding cover is considered to be vegetation capable of hiding 90% of a standing adult deer from view of a human at a distance of 200 feet during all seasons in which deer normally use the area (Jageman 1984). During fall hunting seasons, deer may use the heaviest cover available to avoid detection (Sparrowe and Springer 1970). In contrast to elk, effects of secondary roads on white-tailed deer are not well documented. Because of their more secretive nature and smaller home ranges, white-tailed deer may be less subject to functional loss of habitat due to behavioral displacement than elk (Lyon 1979), especially where cover is dense. In contrast, road density, which was an important influence on elk vulnerability to hunting season mortality (Leptich and Zager 1991, Unsworth et al. 1993, Hayes et al. 2002), likely increases white-tailed deer vulnerability to hunting season mortality by affecting hunter distribution and deer-hunter encounter rates, and eliminating refugia. Additional research is needed to illuminate importance of secondary roads on deer habitat use and survival.

Arid Southern Idaho Habitats

White-tailed deer habitat use in southern Idaho has not been well studied. Structurally, southern Idaho white-tailed deer habitat most closely resembles habitats of the

central and southern plains regions of the United States. There, white-tailed deer habitats are characterized by low precipitation, extreme seasonal temperature fluctuations, low to moderate topographical relief, plant communities dominated by herbaceous vegetation and low shrubs with tall woody vegetation largely restricted to riparian corridors, and large areas of native plant communities converted to agricultural crops.

Tall woody vegetation associated with stream courses and river corridors are the primary white-tailed deer habitat in this environmental setting. Quantity, quality, and connectivity of these habitats normally are limiting factors for white-tailed deer abundance and distribution. Deer will use large shelterbelts or other tree plantings to some extent depending on distance from core riparian habitat areas. Although like northern Idaho deer they are predominantly browsers throughout the year, some evidence indicates that, where white-tailed deer in these environments live in close proximity to agricultural crops, farm crops can constitute up to 50% of the diet in some seasons (Hill and Harris 1943, Menzel 1984). White-tailed deer are probably more vulnerable to hunter harvest in southern Idaho than in other areas of the state where cover is denser and more widely distributed.

Additional research on white-tailed deer habitat needs in southern Idaho are needed to gain a better understanding of whitetail ecology in this environmental setting and provide a scientific basis for habitat management recommendations. Based on available information, destruction and fragmentation of riparian habitats and competition with livestock within the riparian corridor are probably the most pressing habitat issues for managers of southern Idaho white-tailed deer habitat.

Abundance

Unregulated harvest by miners, loggers, and other settlers during the late 1800s and early 1900s apparently resulted in very low numbers of ungulates in Idaho, including white-tailed deer. Conservative hunting seasons and high-quality habitat produced by large fires and heavy logging in the first third of the 20th century resulted in increasing white-tailed deer populations (Pengelly 1961).

Deer populations continued to increase until the late 1940s, when 2 consecutive severe winters reduced deer numbers throughout the state. Conservative seasons, high quality habitat, a pronounced predator control program combined to allow deer herds to recover quickly. Whitetail numbers appear to have reached a peak in the 1960s, when game managers became concerned about over-browsing of winter ranges and established long hunting seasons in order to reduce deer numbers and improve winter range quality.

White-tailed deer populations declined during the 1970s, likely as a consequence of heavy harvest and declining quality of aging stands of habitat. Populations increased again during the 1980s and early 1990s in north-central and northern Idaho. The winter of 1996/97 was one of the most severe on record and white-tailed deer in portions of the Panhandle and Clearwater regions declined substantially. White-tailed deer populations have apparently increased moderately since the 1996-1997 winter. Roughly 200,000 white-tailed deer currently exist in Idaho, and populations may be approaching levels of the 1950s and 1960s in some areas.

Population Dynamics

Reproduction

The peak of breeding of whitetails in Idaho is middle to late November, with fawns born from late May through late June. Pregnancy and fetal rates of adult does are similar to those found elsewhere, but fawn pregnancy rates in Idaho are low. Generally, reproductive rates for white-tailed deer in Idaho are not dramatically different from those of mule deer.

Survival

The survival of fawns is a primary influence on population size of whitetails the

following year. Survival of fawns in Idaho is influenced heavily by energetic demands from the prior winter on the dam, by summer nutrition, by predation, and by energetic demands of their first winter. Late summer composition surveys averaged 58 fawns per 100 does during September 2001 - 2004. By comparison, fall fawn ratios in mid-western states often exceed 100 fawns per 100 does.

In contrast to populations over much of the United States, natural causes, not hunting, are the primary sources of mortality of white-tailed deer in Idaho. Even with long hunting seasons, annual survival of bucks is relatively high, allowing substantial numbers to reach older age classes, and producing high buck:doe ratios.

Deep winter snows are a major influence on population dynamics of white-tailed deer in the northernmost portion of their distribution, including most of Idaho. During the severe 1996-1997 winter, Sime (pers. commun. 1997) estimated 70% of the white-tailed deer died on her study area in northwestern Montana, including over 90% of fawns. In northern Idaho, natural mortality, including both predation and winterkill, averaged 10% annually for does, and 23% for bucks from 1986 through 1995 (IDFG unpubl. data).

Predation is an important influence on population dynamics of white-tailed deer in Idaho. The most common predators on white-tailed deer include coyotes, bobcats, black bears, mountain lions, domestic dogs, and humans. These predators also prey upon other ungulates such as mule deer, elk, antelope, bighorn sheep, and mountain goats, as well as rabbits, hares, mice, etc.

Coyotes are the most abundant predator on deer in Idaho. In most areas coyotes feed on a wide variety of items. Deer are a part of their diet in at least part of the year. Seasons of greatest concern are during spring fawning and winter. Coyotes have been noted to be efficient predators of neonate fawns where habitat is poor. During winter, coyotes may take a number of fawns due to snow conditions and poor animal condition. Studies have shown that coyotes can cause up to 80 percent of fawn mortality. Because fawns often die of many causes, coyote predation on fawns could be largely compensatory. Most fawns taken by coyotes in winter are in very poor physical condition and likely to die of malnutrition.

Mountain lions are likely the second most abundant predator of deer in Idaho. Their primary prey are deer, elk, and smaller mammals such as lagomorphs (rabbits). Mountain lions feed on deer year round, being most efficient during winter months in deep snow conditions. At the present time harvest data indicate mountain lion populations have decreased in Idaho since the mid-1990s. Mountain lion predation on white-tailed deer changes continuously, and remains an important influence on white-tailed deer numbers statewide.

Black bears have a very diverse diet. Little is known about black bear predation on white-tailed deer in Idaho. Black bears have been shown to be significant predators of elk calves in spring. Predation on deer by black bears is probably highest during a fawn's first 4 weeks, during late spring/early summer. Bears are most effective when habitat is patchy and insufficient to hide fawns.

Wolves are present, but not abundant across white-tailed deer range in Idaho. Elk are the primary prey of wolves in Idaho, but, as evidenced by the reliance of wolves on white-tailed deer in the Midwest, wolves can subsist primarily on white-tailed deer. Currently, the impact of wolves on white-tailed deer in Idaho is likely negligible. As wolf populations continue to increase, their impact on white-tailed deer and other ungulate populations will increase as well.

White-tailed deer populations in Idaho cannot be expected to exhibit the same high

growth rates observed elsewhere in their range, where predation is a minor influence. Although general predator-prey relationships are evident, no single predator species can be expected to track white-tailed deer populations closely. The influence of predation on white-tailed deer is complex, including effects of one predator species on other predators, effects from the presence of alternate prey species, and effects of changing ungulate populations on forage. It is this entire mix that determines the degree to which predators limit white-tailed deer.

White-tailed deer have a relatively high intrinsic rate of increase. When deer populations are at, or near, carrying capacity, predation is most likely compensatory and reducing predation will not increase deer numbers. In this case another agent such as winter mortality or disease will replace predation mortality if predation is reduced. When deer populations are below carrying capacity predator mortality is more likely to be additive. It is often difficult to predict or even know what the current carrying capacity of a deer range is due to ever-changing habitat factors.

Disease

Disease and parasite issues in white-tailed deer are multifaceted and can be very complex. In general, white-tailed deer are the most studied free-roaming ruminant in the United States. Extensive disease investigations and documentation have been done in most parts of the country where white-tailed deer reside.

Historically, the Idaho Department of Fish and Game has not actively conducted targeted surveillance for disease or parasites in white-tailed deer. Disease information is therefore limited and obtained opportunistically. Foreyt and Compton (1991) found no evidence of meningeal worm (*Parelaphostrongylus tenuis*, also known as "brainworm") in northern Idaho. A small number of samples from Idaho were evaluated for bluetongue virus with positive results (MacLachlan et al. 1992). Fluoride toxicosis may be a problem with mineral and hot springs in ungulates in Idaho as it is in Yellowstone National Park (Shupe et al. 1984).

At this time, the primary disease of concern in white-tailed deer in Idaho is epizootic hemorrhagic disease (EHD). EHD is present at a low level within some white-tailed deer populations in Idaho. Serological data from mule deer and elk indicated EHD exposure in 10-20% of animals tested. White-tailed deer, as a primary host of the virus, are likely exposed at a higher rate. Several small and 1 large outbreak of EHD have been documented in white-tailed deer in the Clearwater Region of Idaho. The most recent and largest outbreak (5,000-10,000 deer died) occurred in late summer and fall of 2003. This outbreak centered in the Kamiah area, but occurred in deer ranging from Kendrick south to Riggins and from Lapwai east to Clearwater.

Chronic Wasting Disease (CWD), although not identified in Idaho, may pose problems in the future and warrants continued surveillance. Meningeal worm is not known to be present in Idaho but a large scale survey for this parasite is warranted to better define the current status of this parasite in the state. Other disease or parasite issues may be present or of concern and should be addressed when they become apparent or problematic.

Niche Overlap with Other Ungulates

Whitetails are sympatric in various parts of the state with elk, moose, mule deer, bighorn sheep, mountain goat, pronghorn, and domestic livestock. The degree of competitive influences among these species is unknown, but it is likely that either direct competition for resources, or indirect exclusionary processes occur under some circumstances.

Baty (1995), working on winter range in northwestern Montana, observed spatial separation between white-tailed deer and elk. White-tailed deer used small herd home ranges with abundant over story canopy, whereas elk used large areas with sparse overhead canopy. Baty also found little

overlap in food habits, with elk selecting largely for grasses, and deer selecting for browse. Food habits were similar between white-tailed and mule deer, but there was also a significant difference in preferred habitat, with mule deer occupying drier and more open sites than did whitetails. In Idaho, sites preferred by mule deer are often at higher elevations than those preferred by whitetails during all seasons.

Moose and white-tailed deer distribution overlap substantially in North America. In western United States and Canada, there appears to be enough niche separation that neither species detrimentally affects populations of the other to any large degree. Moose appear to select habitat largely on the basis of forage quality and abundance, while cover is more of a primary factor for whitetails. In eastern United States and Canada, white-tailed deer tend to replace moose not due to competition, but due to the effects of meningeal worm.

Wild sheep and goats select strongly for steep, rocky, open terrain not preferred by whitetails. Pronghorn select for xeric habitat also not preferred by whitetails. Competition for space or forage is considered minimal between white-tailed deer and these 3 ungulates in Idaho.

It is sometimes hypothesized that interbreeding between white-tailed deer bucks and mule deer does could contribute to declines in mule deer populations. Examination of deer at check stations in Idaho has revealed very few obvious hybrid deer, but genetic examination would be required to test the validity of this hypothesis.

Livestock and white-tailed deer use sympatric ranges in many portions of Idaho. Domestic grazing, depending upon the situation, can either enhance or degrade white-tailed deer habitat (Matschke et al. 1984). Extensive grazing of riparian areas generally reduces available habitat for white-tailed deer (Dusek et al. 1989).

Population Regulation

White-tailed deer populations are dependent on habitat quality and quantity. Simply stated, when high quality habitat is abundant, reproductive rates are high, survival is high, and deer numbers will increase. As the number of deer increases, there is less and less forage for each individual, until eventually, reproduction slows, and survival decreases, and the herd decreases. After the population declines, there is again adequate nutrition for remaining animals, and reproduction and survival increase once again. One role of hunting in this model is to keep deer numbers sufficiently low such that reproduction and survival is high, resulting in a more stable population and a harvestable surplus of deer each year.

The forage competition model above provides a useful overall framework for a general understanding of how ungulates interact with the vegetative component of their environment. However, other factors, both density-independent and density-dependent, may influence a population more than forage competition. The 2 most prominent factors affecting white-tailed deer in Idaho are winter weather and predation.

Various populations of white-tailed deer are regulated by different combinations of factors. A single population may be regulated primarily by forage availability one year, a combination of forage availability and winter severity the next year, and forage and predation the third. The key to managing these populations is in understanding the importance of these influences, our ability to modify these influences, and our ability to adapt to those influences.

Hunting

Human beings have hunted white-tailed deer for at least 15,000 years in North America. Historical information on regulated harvest is available only for the past 140 years. In 1863 Idaho Territory was organized, including not only all of present-day Idaho, but all of Montana and much of Wyoming. The following year, the first known restrictions were placed on deer hunting, allowing no hunting between February 1 and June 30. The first bag limit of 4 deer was established in 1899, 9 years after Idaho's statehood. Hunting licenses were first required in 1903. Closure of hunting seasons by county occurred periodically during the early 1900s and numerous legislatively created "game preserves" were established to increase populations of game animals throughout the state. The first Game Management Unit (GMU) was established in 1942 to help regulate hunting, and by 1959 the entire state had been partitioned into the present day framework.

During the 1950s and 1960s wildlife managers were primarily concerned about the effects of burgeoning ungulate populations of the state, and their subsequent overbrowsing of winter ranges. Liberal harvest seasons were instituted in many parts of Idaho to reduce ungulate populations to maintain winter habitat in good condition. In response to declining mule deer numbers, more conservative deer hunting seasons were established in the mid-1970s. However, relatively long seasons were maintained where white-tailed deer dominated the harvest. The first species-specific deer season was established in 1974 in the Clearwater Region, when GMU 11 was closed to mule deer hunting, but remained open for general white-tailed deer hunting.

During the 1980s, deer hunting seasons were liberalized to take advantage of increasing populations and to help resolve increasing depredation concerns. In 1985, late season white-tailed deer opportunity, already available in 7 Clearwater and 9 Panhandle units, was expanded to include 7 additional Clearwater units.

By the mid-1990s, drought had forced short, buck-only seasons for mule deer in much of southern Idaho. This contrasted with long either-sex seasons in northern Idaho, leading to Clearwater Region concerns for trespass and high buck mortality. In 1998 the Idaho Fish & Game Commission established the Clearwater Deer Tag to address these local concerns caused by displacement of hunters from southern Idaho.

Harvest Monitoring

Deer harvest data (both species combined) in Idaho has been collected since the early 1930s. Various techniques have been used to estimate harvest including check stations, tag returns, voluntary hunter reports, random telephone surveys, and, currently, a mandatory harvest report. Although not used to estimate harvest, check stations are operated to provide immediate feedback to wildlife managers about the hunting season, serve as an enforcement tool, provide an opportunity for Department personnel and sportsmen to interact, and allow for collection of biological data. Estimates derived from the random telephone survey (1982-1998) and mandatory harvest reports (1998-present) have produced the most reliable results. Information collected includes total hunter numbers, success, species, sex, antler points, GMU, weapon type, and days of effort.

Trends in harvest roughly correspond with trends in deer populations. The highest recorded harvest occurred in 1989 with an estimated 95,200 deer harvested of which 18,300 were white-tailed deer. Peak white-tailed deer harvest of 29,800 occurred in 1994.

Presumably, total statewide deer harvest during the mid to late 1900s was

dominated by mule deer. In 1975 the Department began differentiating mule deer and white-tailed deer harvest. In 1994 white-tailed deer harvest exceeded mule deer harvest, probably for the first time in recent history. From 1994 through 2003, white-tailed deer have averaged 43% of the total statewide deer harvest.

Estimates of total number of deer hunters (both species) since 1982 indicate no general trend, varying between 107,300 and 154,500 hunters annually. Shifts in distribution of hunters across the state have occurred during the past decade, primarily in response to reduced mule deer hunting opportunity in southern Idaho. Particularly during the mid-1990s, deer hunter numbers increased in the Clearwater and Panhandle regions while numbers declined in southern Idaho, following significant mule deer mortality during the winter of 1992/93. The tag system prior to this plan did not allow the Department to distinguish between mule deer or white-tailed deer hunters, allowing only an estimate of all "deer" hunters.

Population Monitoring

Numerous techniques have been used throughout white-tailed deer range to estimate population size, including mark/recapture, change-in-ratio, change-in-hunter-success, catch-per-unit-effort, population reconstruction, and aerial surveys (Lancia et al. 1996).

In much of North America, white-tailed deer are managed using harvest-based, deterministic modeling. This approach functions best when recruitment rates are relatively constant, where hunting is the overwhelming source of mortality, and where harvest information is detailed, usually through some form of mandatory registration combined with extensive check stations or locker checks of deer ages. In some areas, winter severity influences are modeled to correct for variation in recruitment and survival, and limited aerial surveys, road-kill indices, success rates, and other measures are used to adjust the final population estimate. Infrequently used techniques include aerial and spotlight surveys, capture/mark/recapture techniques, pellet-count indices, and catch-per-effort techniques.

Neither accounting-type models nor population reconstructions are appropriate for use in managing white-tailed deer in Idaho due to prominent influences of winter severity and predation, the relatively minor role of hunting in overall mortality, and lack of detailed age information of harvested animals.

Wildlife managers in Idaho have primarily used total harvest and changes in distribution to monitor population trends. Percentage of antlers with 4 or more points on the right side has been used in Idaho as an index to male survival for monitoring total survival. Recent analysis indicates that the percentage of antlered bucks in the harvest with at least 4 points on 1 antler is relatively insensitive to changes in harvest or hunting season structure, a consequence of the relatively narrow range of hunting mortality rates observed in Idaho whitetails (IDFG unpubl. data). Williamson (2003) recommended against use of age ratios from harvested animals in monitoring white-tailed deer populations. By extension, management based simply on antler point criteria may be weak as well.

Hunter success has also been used to infer trend in Idaho, but this index is of limited usefulness in those units with both white-tailed and mule deer because biologists cannot distinguish which species the hunters are pursuing. Changes in hunting regulations further hinder this technique in the analysis and long-term monitoring of white-tailed deer populations in the state. Helicopter surveys of winter range are periodically being used in a few locations to monitor population trends. In Idaho's Panhandle Region, spotlight surveys are used to evaluate survival of fawns through summer.

It can be reasonably argued that white-tailed deer management in Idaho does not require close monitoring because population change is not integrally tied to changes in hunting regulations. However, a solid monitoring program is needed to give managers the ability to understand when whitetail

populations have changed, to adapt management to those changes, and to explain circumstances to the public.

White-tailed Deer Research

Mule deer and elk have historically received research emphasis in Idaho. Research on whitetails has occurred sporadically and been primarily focused on habitat use, food habits, and migration patterns (Thilenius 1960, Pengelly 1961, Thilenius and Hungerford 1967, Will 1972, Keay and Peek 1980, Owens 1981, Pauley 1990, Baumeister 1993, Secord et al. 1993). Additional work has been completed to evaluate survival and cause-specific mortality (IDFG unpubl. data). Studies have also been conducted to determine behavior patterns of white-tailed deer in Idaho (see Gladfelter 1966, Howard 1969).

Although some research has been conducted, the need still exists for basic population ecology data for white-tailed deer in Idaho. Habitat use/relationship, survival, mortality, and productivity information do not exist for most of Idaho's whitetail populations. Additionally, managers need a cost-effective, reliable method to either enumerate or index populations. The EHD outbreak in 2003 adds another series of questions about long-term ramifications of the disease on population dynamics.

Statewide Estimate Deer Harvest, 1935-2003